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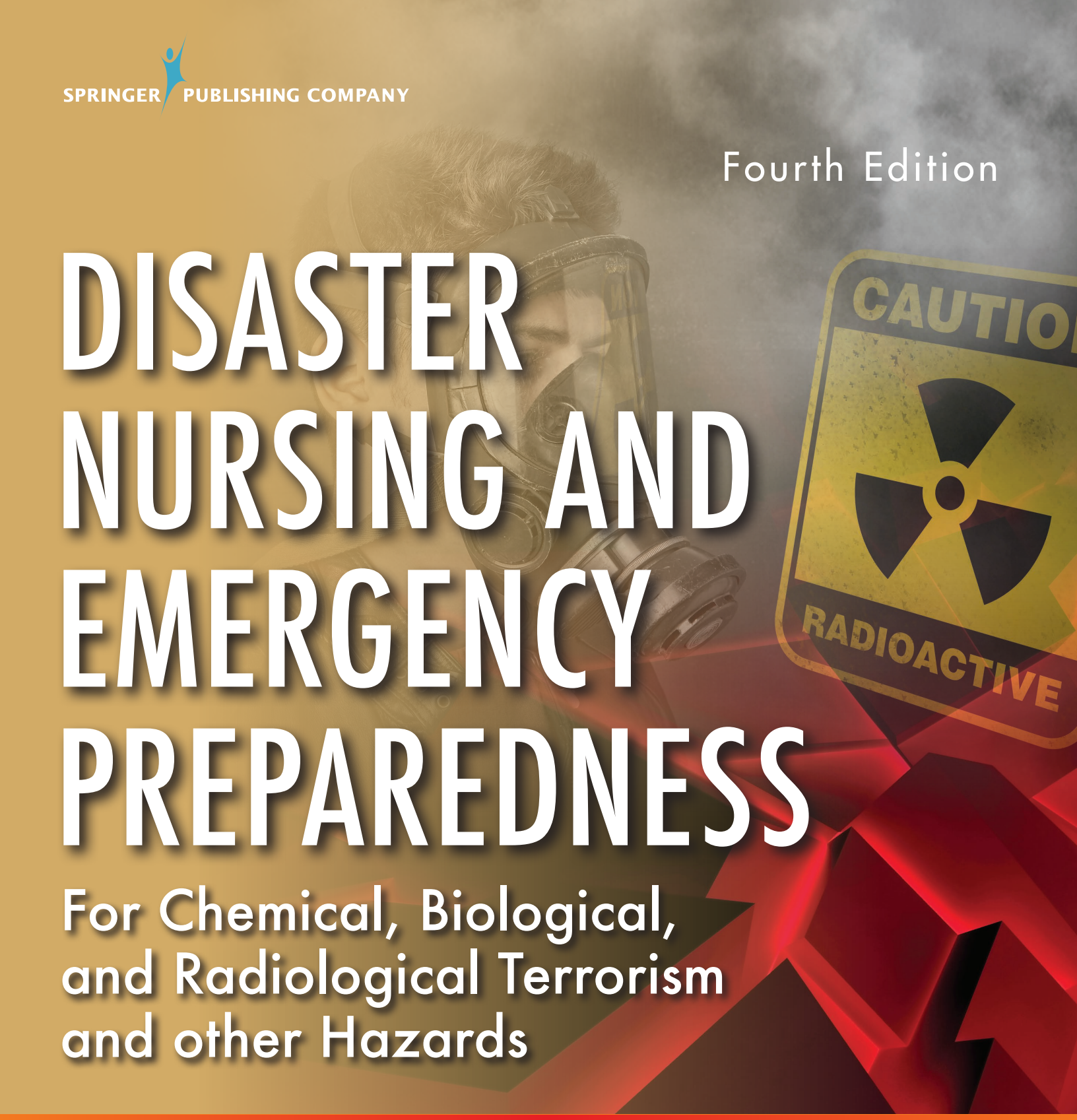

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CLIMATE CHANGE AND HEALTH: THE NURSE'S ROLE IN POLICY AND PRACTICE

Karen Levin and Thomas Chandler

LEARNING OBJECTIVES

When this chapter is completed, readers will be able to:

1. Describe the real and potential impacts of climate change on human health.
2. Appreciate the physical drivers of climate change.
3. Describe the nurse's role in mitigation and adaptation efforts to reduce climate change impacts on human health.
4. List vulnerable populations at most risk for poor health outcomes related to climate change.
5. Identify new studies that confirm observed climate changes and validate climate models.
6. Describe areas in practice and advocacy where nurses can contribute to addressing climate change and health risks, including how Green Teams can benefit an organization.

KEY MESSAGES

Widespread scientific consensus exists that the world's climate is changing. Some of these changes will likely include more variable weather, heat waves, heavy precipitation events, flooding, droughts, more intense storms, sea level rise, and air pollution. Each of these impacts could negatively affect population health.

While climate change is a global issue, the effects of climate change will vary across geographical regions and populations, with vulnerable populations at higher risk for adverse health consequences.

Healthcare professionals recognize that there is a direct and indirect connection between climate change and human health.

Knowledge of climate change drivers and their effects must be part of the nurse's assessment and decision making in the development of patient and community care plans.
The health of the public must be protected—nurses can play a vital role in the reduction of climate change–related impacts on human health.

CHAPTER OVERVIEW

Widespread scientific consensus exists that the world's climate is changing, with a majority of scientists in agreement that anthropogenic climate change is having increasingly adverse effects on human health (National Aeronautics and Space Administration [NASA] Global Climate Change, 2018; U.S. Global Change Research Program [USGCRP], 2017). Some of these changes include rising temperatures, more variable weather, heat waves, heavy precipitation events, flooding, droughts, more intense storms, sea level rise, and air pollution. Each of these impacts is currently or has the potential to negatively affect population health. While climate change is a global issue, the effects of climate change will vary across geographical regions and populations (Centers for Disease Control and Prevention [CDC], 2017a). The influence of climate change on human health appears in scientific, environmental, and public health literature, and, in more recent years, a growing discussion and advocacy for personal and professional response are present in the nursing literature. This chapter provides an overview of the influence of climate change on health, along with a selection of key findings from surveys exploring nurses' knowledge, beliefs, and challenges in responding to climate change. A wide range of ongoing activities at various practice settings offers resources for further study and action opportunities for nurses and their healthcare partners.

Climate change is widely considered one of the greatest public health threats currently facing humanity. Anthropogenic climate change, together with other natural and man-made health stressors, influences human health and disease in numerous ways (USGCRP, 2017). Some existing health threats will intensify and new health threats will emerge and not everyone is equally at risk. Important considerations of risk for climate change–related health impact include age, economic resources, and location (CDC, 2017a). In the United States, public health can be affected by disruptions of physical, biological, and ecological systems, including disturbances originating domestically and elsewhere. The impact of climate change on human health and the effects of these disruptions include increased respiratory and cardiovascular disease, injuries and premature deaths related to extreme weather events, changes in the prevalence and geographical distribution of food- and waterborne illnesses and other infectious diseases, and threats to mental health. Emphasizing this point, the 2015 Lancet Commission on Health and Climate Change argues that the response to climate change could be "the greatest global health opportunity of the 21st century" (Watts et al., 2017). Evidence of the drivers of climate change and its impact on human health are further substantiated in USGCRP, 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume I.*

Built on the vast scientific body of global and climate change work to date, this chapter presents an overview of the basics of climate change. The perspective then shifts to the effects of climate change on human health consequences, what has been done, and what future work needs to be done. Since the days of Florence Nightingale, the practice of nursing has been rooted in "person, environment, and health" as the interrelated determinants of health (McDonald, 2001). Climate change's complex interaction and the social–physical determinants of health fit well into this framework. The nurse's role in mitigation measures to reduce the vulnerabilities of climate change's most negative effects on human health are presented. The illness, injury, death, displacement, and tremendous housing and economic losses as a result of climate change–related events such as the 2017 Atlantic hurricane season and the northern California wildfires reinforce the importance of this work.[1] The nurse's role in patient and community mitigation[2] and adaptation[3] measures to address climate change's most negative impacts on health requires a clear understanding of these interactions and health consequences.

PHYSICAL DRIVERS OF CLIMATE CHANGE

Despite often contentious public and political debate, the physical drivers of climate change are quite clear. Greenhouse gases such as carbon dioxide (CO_2) absorb heat (infrared radiation) emitted from the earth's surface. Since the mid-1800s when humans began to burn coal, gas, and oil, scientists have known that CO_2 is one of the main greenhouse gases of importance to Earth's energy balance. Other greenhouse gases (notably methane and nitrous oxide) are also increasing as a consequence of human activities. The observed global surface temperature rise since 1900 is consistent with detailed calculations of the impacts of the observed increase in atmospheric CO_2 (and other human-induced changes) on Earth's energy balance. Increases in the atmospheric concentrations of these gases cause the earth to warm by trapping more of this heat. Human (anthropogenic) activities—especially the burning of fossil fuels since the start

[1] Erdman, J. Atlantic Hurricane Season 2017 is Now Seventh Most Active in History. https://weather.com/en-CA/canada/news/news/2017-10-09-atlantic-hurricane-season-one-of-busiest-october.
[2] Actions being taken to reduce greenhouse gas emissions and to enhance the sinks or traps or remove carbon from the atmosphere.
[3] Actions being taken to lessen the impact on health and the environment due to changes that cannot be prevented through mitigation.

of the Industrial Revolution—have unquestionably increased atmospheric CO_2 concentrations by about 40%, with more than half the increase occurring since 1970 (National Academy of Science and Royal Society, 2015; USGCRP, 2017).

Since 1900, the global average surface temperature has increased by about 0.8°C (1.4°F). This has been accompanied by warming of the ocean, a rise in sea level, a strong decline in Arctic sea ice, and many other associated climate effects. Much of this warming has occurred in the last four decades and detailed analyses have shown that the warming during this period is mainly a result of the increased concentrations of CO_2 and other greenhouse gases. Continued emissions of these gases will cause further climate change, including substantial increases in global average surface temperature and important changes in regional climate. The magnitude and timing of these changes will depend on many factors, and slowdowns and accelerations in warming lasting a decade or more will continue to occur. However, long-term climate change over many decades will depend mainly on the total amount of CO_2 and other greenhouse gases emitted as a result of human activities (National Academy of Science and Building Royal Society, 2015).

There is overwhelming evidence that climate change has contributed to:

- Higher average global temperatures and sea levels
- Decreased sea and land use levels
- Changes in precipitation patterns
- Increased frequency of extreme weather events: heat waves, droughts, hurricanes, and wildfires
- Heavy pollution
- Shifts in animal and plant habitable ranges (Intergovernmental Panel on Climate Change [IPCC], 2014; National Academy of Science and Royal Society, 2015)

Addressing the genesis, impact, and prognosis for the future of climate change includes implementation of strategies designed to limit global energy consumption, reduce fossil fuel emissions, and slow the rate of warming (Department of Defense [DOD], 2014; Hansen et al., 2013; IPCC, 2014; Santer et al., 2017; USGCRP, 2014). Recent studies also emphasize the relationships between human health and climate change (Birnbaum, Balbus, & Tart, 2016; Ebi, Fawcett, Spiegel, & Tovalin, 2016; Marinucci, Luber, Uejio, Saha, & Hess, 2014; USGCRP, 2017).

Climate change connects to a wide range of health issues, ranging from cardiovascular deaths and respiratory illnesses related to heat extremes, to waterborne and vectorborne infectious diseases that are related to disruptions in mosquito, tick, and rodent habitats. Figure 21.1 shows the relationship between climate change and its impact on human health.

Although scientists recognize that some climate changes, such as lower cold-related mortality, will be beneficial, there is consensus that the majority of the changes will be highly detrimental (Bouzid, Hooper, & Hunter, 2013) for a wide range of health issues, with human morbidity rates varying according to geographical regions within the United States and globally (IPCC, 2014; Watts et al., 2017). The National Institute of Environmental Health Studies (NIEHS)-led Interagency Working Group on Climate Change and Health identified major research areas that need to be further explored and understood (Portier et al., 2010). These include the following:

- Asthma, Respiratory Allergies, and Airway Diseases
- Cancer
- Cardiovascular Disease and Stroke
- Foodborne Diseases and Nutrition
- Heat-Related Morbidity and Mortality
- Human Developmental Effects
- Mental Health and Stress-Related Disorders
- Neurological Diseases and Disorders
- Vectorborne and Zoonotic Diseases
- Waterborne Diseases
- Weather-Created Morbidity and Mortality

The dynamics of climate change's regional weather changes and human exposures, direct or indirect, will be related most directly to extreme weather, flooding, and heat wave events as well as changes in geographical habitats of vectorborne diseases (Barna, Goodman, & Mortimer, 2012). Climate change–related water disasters have been associated with major environmental disruption resulting in exposures to toxins, molds, and infectious agents with resultant significant morbidity and mortality (Veenema et al., 2017). These health concerns represent cross-cutting issues for vulnerable and susceptible populations.

SELECTED HEALTH OUTCOMES

Extreme Weather Events

Wildfires, droughts, hurricanes, heavy rainfall, river flooding, landslides, mudslides, and soil erosion caused or exacerbated by climate change will result in injuries, fatalities, and illness that can result from postdisaster water quality and safety issues and waterborne diseases. Mass shelter care requires a coordinated multiagency response and surge capacity of healthcare personnel to assure adequate delivery of care, placing nurses in multiple roles at the front lines of care (Divakaran, Lembeck, Kerr, Calmus, & Potter, 2016).

Thermal Extremes (Heat and Cold)

Heat-related morbidity and mortality will increase (Schmeltz, Petkova, & Gamble, 2016). Research has demonstrated that the most severe impacts of extreme heat events—caused by air pollution as well as temperature—fall on children, the elderly, the chronically ill, the obese, people with hypertension (particularly if taking diuretics), and people taking psychiatric medications (Ebi, Fawcett, et al., 2016). In warm, dry regions already at risk of wildfires, the fire season could be extended and become more severe, increasing the risk to children and to adults with respiratory diseases who are particularly susceptible to particulates (soot) and carcinogens (D'Amato et al., 2015). Nurses can serve on local, state, and regional adaptation planning bodies for planning related to extreme heat and poor air quality events, identify those in their practices who are at

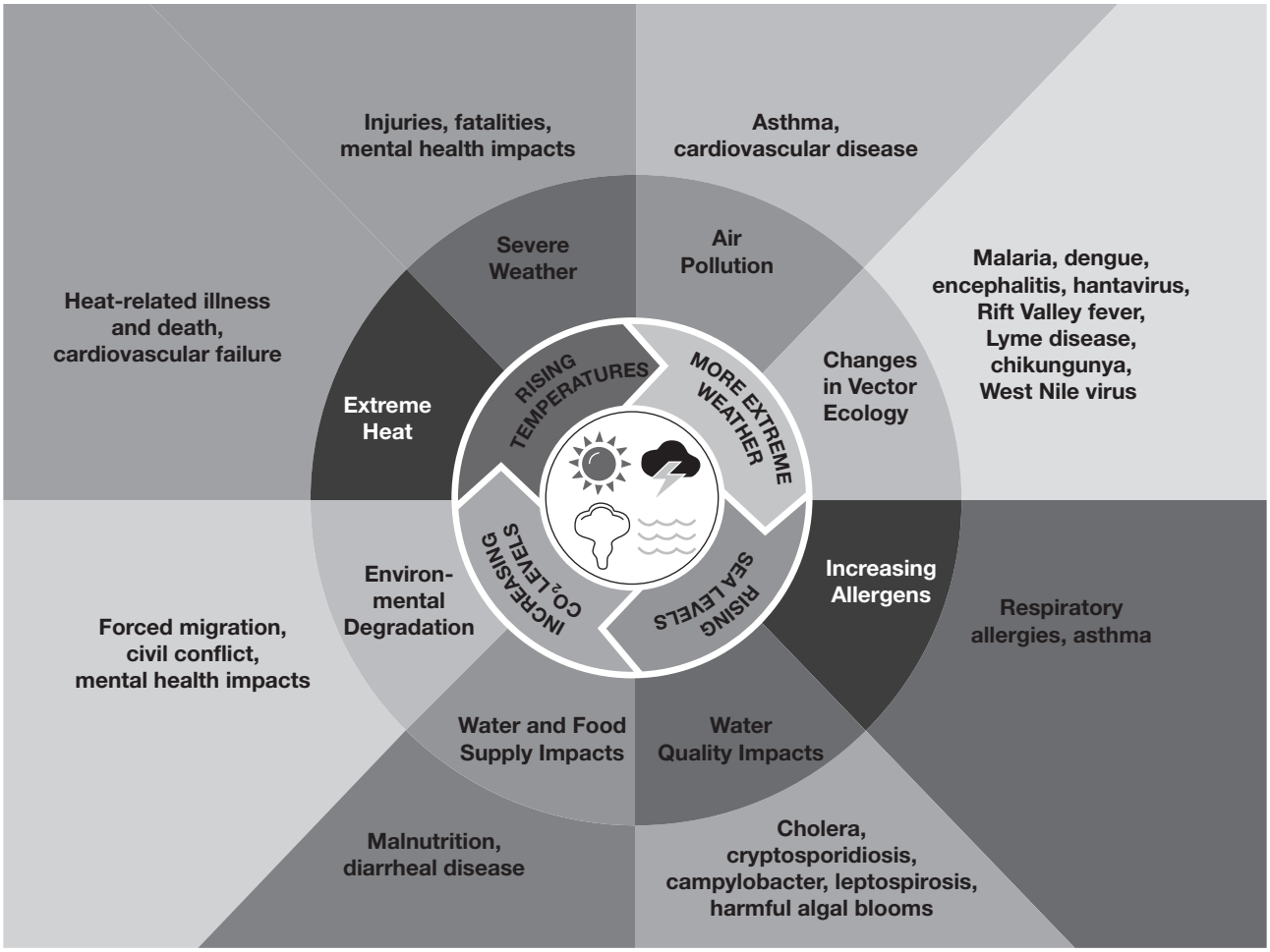

FIGURE 21.1 Impact of climate change on human health.

Source: Centers for Disease Control and Prevention. (2017a). Climate effects on health. Retrieved from https://www.cdc.gov/climateandhealth/effects/default.htm

most risk, including those who work outside in extreme heat, and provide targeted care plans to minimize the health consequences of extreme weather events (Prudent, Houghton, & Luber, 2016).

Vectorborne and Zoonotic Diseases

Climate change has and will continue to expand the habitats of climate-sensitive vectors, increase their reproduction rate, and thereby increase the prevalence of diseases transmitted by mosquitoes, ticks, and rodents[4] (Jia et al., 2017). Integrated vector management is essential to control vectorborne disease transmission. Health action alerts and social mobilization and communication at all levels are critical for ensuring appropriate and effective interagency and community communication between vector control staff and householders, and between partners within and outside the health sector where human-vector exposure occurs (i.e., schools, hospitals, and other workplaces). Nurses can and do provide essential roles in these communications: as collaborators for developing agency health alerts and risk-prevention measures, and as public spokespeople during disease outbreaks. Nurses have been public spokespeople for health agencies and can collaborate on messaging community alerts, guidance on prevention measures and agency response to vector habitat changes and disease outbreaks. Additionally, nurses can coordinate when and how to use the mass media at national, regional, and local levels in collaboration with public information officers.

Food- and Waterborne Diseases

Climate change–related temperature fluctuations can also affect food- and waterborne infectious diseases[5] such as gastritis, which can be fatal in children (EPA, 2018), particularly those who already have other compromising vulnerabilities and/or illnesses. Lower-lying coastal regions could experience increased flooding, saltwater infiltration, severe and harmful algae blooms (HAB) such as Red Tides, thus increasing susceptibility to various other food- and waterborne diseases (Rossati, 2017). The expected continuation of global warming

[4] Malaria, West Nile virus, Eastern equine encephalitis, dengue [27], Rift Valley fever, and tickborne diseases such as Lyme disease.

[5] *Salmonella, Campylobacter, Vibrio spp., Leptospira, Giardia, and Cryptosporidium.*

will lead to increased risk of several food and waterborne diseases including those caused by *Salmonella, Campylobacter, Vibrio cholerae, Leptospirosis, Giardia*, and *Cryptosporidium.*

VULNERABLE AND SUSCEPTIBLE POPULATIONS

Health disparities exist in societies, creating subpopulations that are at higher risk of poor health outcomes. According to the U.S. Global Change Research Program Climate and Health Assessment,[6] key drivers of vulnerability include age, socioeconomic status, race, indigenous peoples, current level of health and regional variations such as floodplains, coastal zones, and urban areas, as well as the resilience of public health infrastructure. Children, the elderly, the sick, the poor, and some minority communities are among the most vulnerable to climate change–related health effects (CDC, 2017b). There are those in our communities who are more susceptible, such as children and the elderly, and those who are more vulnerable, such as people with medical issues, mental health and chronic diseases, and the urban poor who have an increased health risk from environmental exposures. Those who are both susceptible and vulnerable become subject to a magnified risk. Some, whose health will suffer the most, already feel they are at risk (Akerlof, Delamater, Boules, Upperman, & Mitchell, 2015).

Knowledge and awareness of climate change effects and their direct and indirect effects (Figure 21.2) must be part of the nurse's assessment and decision making. It is critical that nurses have a solid understanding of climate change–sensitive diseases and those who are at risk of negative health outcomes to ensure that mitigation and risk communication strategies incorporate these elements. Nurses must identify those at higher risk of climate change's negative health consequences and ensure that they receive, understand, and can follow risk communications and guidance from all agency health alerts. Furthermore, it is essential that vulnerable communities have input into the planning processes of healthcare agencies and community practitioners to ensure effective risk communications. Nurses are in the best position to bridge and facilitate these connections (Marinucci et al., 2014). Nurses in direct client care, community-based healthcare workers, public health and/or home health nurses can leverage home visits to educate at-risk clients about climate change and health risk connections, identify mitigation, adaptation opportunities, and challenges and provide an action plan that is effective and responsive to their unique needs.

Children

For a variety of physiological and social reasons, children are more susceptible and vulnerable to environmental stresses than adults. They have a smaller body mass to surface area ratio and greater sensitivity to certain exposures such as heat waves (Miller, Marty, & Landrigan, 2016). Their immune and heating regulatory systems are not fully developed and thus are highly susceptible to extreme weather events, air pollution, food- and waterborne diseases, and vectorborne diseases (Ebi, Semenza, & Rocklöv, 2016). School nurses should be alert to children who have known

[6] http://nca2014.globalchange.gov/report/sectors/human-health#intro-section-2

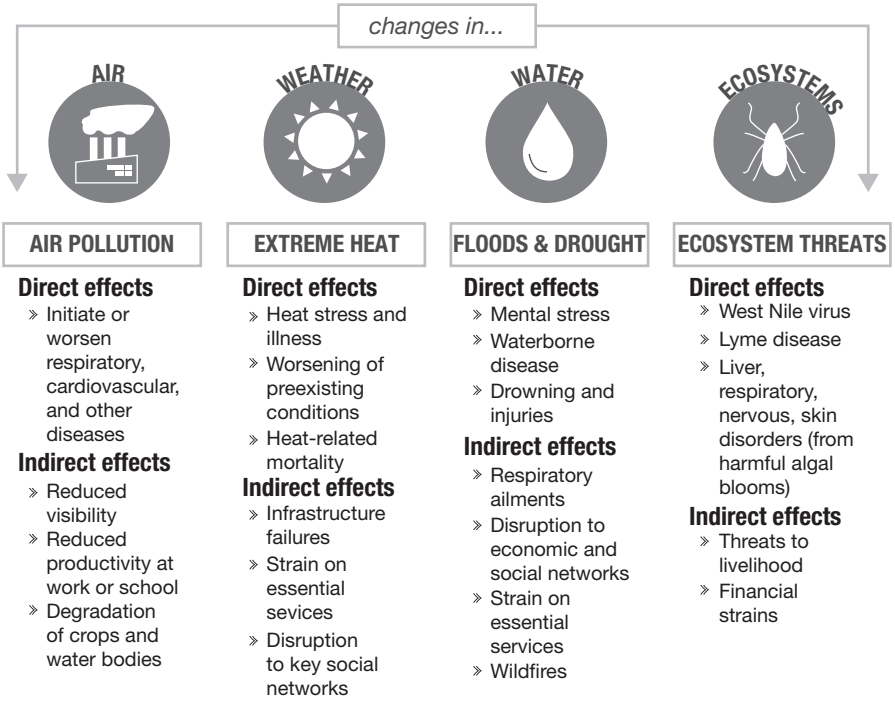

FIGURE 21.2 Direct and indirect health effects of climate change.

Permission granted by Minnesota Department of Health. (2017). Minnesota Climate and Health Program. Retrieved from http://www.health.state.mn.us/divs/climatechange

medical conditions and require intervention during environmental health alerts. In particular, school nurses are in a good position to contribute to policies that can "provide indoor alternatives" on bad air days for asthma-susceptible children[7] (Domrose, 2015).

Elderly

Elderly adults, who often live alone and may have preexisting heart or lung conditions, are especially susceptible to heat-related illnesses, hyperthermia, heat stress,[8] cardiovascular failure, and dehydration, which can lead to falls and other injuries. Nurses who practice in areas with a high elderly population can protect this population by identifying at-risk patients and providing them and their caregivers with guidance about staying well-hydrated, using home air conditioners, and visiting air-conditioned places and cooling centers.

Urban Poor

Poorer residents of high-density, heat-trapping urban environments often have less access to healthcare and "limited adaptive capacities, such as improved building materials, lack of air conditioning or ability to access cooling centers and their limited ability to relocate to a less stressed environment" (Ebi, Fawcett, et al., 2016a). Further, many of these vulnerable populations are located in flood-prone regions which are at risk of increased precipitation and sea level rise. Nurses must identify patients who live and work in these communities and ensure they are aware of their vulnerabilities and, together, create health-risk prevention plans.

Mental Health

Disasters, including climate- and weather-related ones, can induce in people with and without a history of mental illness alike, trauma, shock, anxiety, depression, complicated grief, posttraumatic stress disorder (PTSD), and strains on personal relationships (Trombley, Chalupka, & Anderko, 2017). They can also increase the incidence of alcohol and substance abuse, homicide, suicide, physical abuse, and spousal abuse. Research has further noted that climate change–oriented problems, such as mass migration from a coastal municipality, can induce psychological stressors not originally foreseen (Ziegler, Morelli, & Fawibe, 2017). Nurses should be aware of these potential stressors and be prepared to address them in collaboration with mental health professionals.

THE NURSE'S ROLE IN CLIMATE CHANGE

National studies show that nurses recognize the numerous ways that climate change affects health, yet many feel they are not well enough prepared to meet those challenges. In one study, nurses agreed that public health nursing had the responsibility to address health-related impacts of climate change, yet some doubted that actions could decrease health-related impacts. Furthermore, most felt they were not prepared and that within their departments they did not have the ability to address health-related impacts of climate change due to limited resources and personnel allocated to this endeavor (Polivka, Chaudry, & Mac Crawford, 2012).

A study among hospital, primary care, and emergency room nurses in Sweden found that public health work was regarded as a health cobenefit of climate change mitigation and that nurses perceived a responsibility for individual and professional commitment to opportunities to positively influence the environment (Anåker, Nilsson, Holmner, & Elf, 2015). A similar study of Canadian nurses concurred with these studies in that nurses were only moderately knowledgeable about climate change and its specific health threats and felt this was an area for further development and training. They expressed interest in climate change as an important determinant of health and the need for integrating it into practice, in agreement with the Canadian Nurses Association's list of nurse actions to address climate change (Angelini, 2017; Laan, 2014).

Nursing is a clinical profession grounded in evidence. A nurse is a researcher and a consumer of research, identifying and translating new and emerging information to the practice setting. Integration of new findings often requires new ways of thinking and acting, engaging and incorporating a system-wide approach to meet healthcare needs both now and in the future. Nurses can apply mitigation and adaptation measures, personally and professionally, to address known and *emerging* health impacts in our changing climate (Angelini, 2017). As revealed in the aforementioned studies, many nurses believe there are negative health outcomes of climate change, believe there is a role for nurses, yet, they express a lack of preparedness for this role and a degree of uncertainty of the most appropriate tasks to carry out. For instance, consider the following description:

> A nurse midwife[9] noticed on days with elevated pollution levels that mothers-to-be with previously controlled asthma came into her office wheezing and struggling for breath, putting themselves and the fetuses they were carrying at risk. She adjusted medications and advised her patients to stay inside on bad air days, but many of them worked and didn't have cars or even air-conditioning. Staying out of the bad air wasn't a reasonable option. She asked herself, "What can I do to help?" (Domrose, 2015)

What Are Nurses Doing?

Collaboration and Practice

The scientific evidence for anthropogenic climate change has been established with increasing precision and as described earlier in this chapter, there are growing concerns about its potential to undermine the public health gains of the past century. There is also a growing consensus across private and public sector organizations at both the national and the

[7] Domrose, C. (2015, October 12). Quote from Laura Anderko, PhD, RN, Director of Mid-Atlantic Center for Children's Health and the Environment, School of Nursing and Health Studies, Georgetown University, DC.

[8] Advanced age represents one of the most significant risk factors for heat-related death in the United States (Health Implications of Climate Change Physicians for Social Responsibility) http://www.psr.org/assets/pdfs/heats-deadly-effects-1.pdf

[9] Domrose, C. (2015, October 12), Interview, quote from Katie Huffling, MS, RN, CNM, who later testified at an Environmental Protection Agency hearing in the matter of ozone levels and the relationship of air pollution and asthma and asthma and preterm pregnancy.

international levels that carbon reduction must be a policy aim. International nursing organizations have made strong position statements on the issue, arguing that nurses should be actively engaged as part of their roles in both clinical practice and health promotion. Nurses can work with the American Nurses Association (ANA) in the United States and other national and international nursing organizations to advocate for and develop public policies that address climate change at local and regional levels. The ANA has long partnered with environmental agencies and groups such as Healthcare Without Harm,[10] Practice Greenhealth (formerly Hospitals for a Healthy Environment), the U.S. Environmental Protection Agency and the University of Maryland, and collaborated on projects such as the Luminary Project[11] and RN no Harm.[12]

TABLE 21.1 Green Teams: Hospital Health Facilities, Health Clinics, Office-Based Practice

Waste reduction in the hospital	Ensure proper protocols are in place and followed. Can result in reduction in energy wastes and environmental toxicants released into the community.
Purchasing and materials management	Advocate for "environmentally preferable purchasing"; consider the cycle of products from management to disposal; examine products for toxins, i.e., mercury, polyvinyl chloride (PVC), carcinogens, endocrine disruptors
Unused pharmaceuticals	Improper handling of unused medications is one way pharmaceuticals can enter the water supply (Becker, Mendez-Quigley, & Phillips, 2010).
Cleaning products and hazards	Nurses and other employees are at risk of exposure to hazardous materials: housekeeping and sterilization chemicals, pharmaceutical residuals, and other toxins. Nurses and their teams can advocate for safer products, clear labeling, and following label and Occupational Safety and Health Administration (OSHA) directions for use and disposal.
Dietary services	Advocate for fresh and local purchasing, composting.

Source: McDermott-Levy, R. (2011). The nurse's role on green teams: an environmental health opportunity. *The Pennsylvania Nurse, 66*(1), 17–21. Retrieved from https://www1.villanova.edu/content/dam/villanova/sustainability/Faculty%20Research/McD-LNurseGreenTeam.pdf

[10] A U.S.–Canadian Collaboration, See "Consortiums Collaborations" section.
[11] The Luminary Project highlights nurses' efforts internationally. Shares best practices (see "Advocacy, Alliances and Interdisciplinary Partnerships").
[12] Nurses Work Group, Health Care Without Harm. https://noharm-uscanada.org/content/us-canada/nurses-workgroup

Nurses can be involved in mitigation and adaptation in their healthcare practice settings through forming and participating on Green Teams.[13] Green Teams can be established in any practice setting, primary care, hospital or other healthcare facilities, skilled nursing facilities or hospice, wherever patient and healthcare supplies use recyclable product packaging, "red bag" receptacles for medical wastes, or where there is a policy for increasing corporate sustainability (Sayre, Rhazi, Carpenter, & Hughes, 2010). These collaborative teams provide nurses the opportunity to contribute their nursing knowledge, work across disciplines, and positively influence the communities they serve (McDermott-Levy, 2011; Table 21.1). Additionally, nurses can form "green committees" within their schools of nursing or be representatives on university committees (Powers & Kennedy, 2011).

Education and Policy

Nurses are responding to the urgent need to address climate change at multiple levels and in a variety of practice settings and through interdisciplinary collaborations with a wide range of healthcare delivery systems and partners. Nurses are currently engaged in climate change–related education, research, and interdisciplinary partnerships, alliances, policy, and advocacy. These efforts have expanded nurses' knowledge and perceptions through educational venues: classroom, guest lectures, seminars, partnership alliances, and participation in White House Climate Change and Health conferences, 2015 and 2016.[14,15]

2016 WHITE HOUSE ROUNDTABLE ON THE IMPACTS OF CLIMATE CHANGE ON PUBLIC HEALTH[16]

More than 30 deans of nursing (8), medical (8), and public health (15) schools took part in a White House roundtable on climate change and health with the commitment "to ensuring that we train the next generation of health professionals to effectively address the health impacts of climate change." The White House archives indicate 118 schools in the United States and other countries have signed *The Health Educators Climate Commitment*. A review of the Health Educators Climate Commitment Fact Sheet reveals that 71 U.S. medical and public health schools, and 13 U.S. schools of nursing signed the commitment pledge:

> to ensure that students, the next generation of health professionals, are prepared, through education and training, to effectively address the health impacts of climate change, and to ensure that the world has a cadre of climate change and health experts.

Schools proposed to review curricula for opportunities to address the effects of climate change on human health, and

[13] Green Teams—multidisciplinary group of hospital-based nurses and employees who support and sustain institutional practices, e.g., in reduction of hospital wastes, energy, water consumption and overall carbon footprint.
[14] https://obamawhitehouse.archives.gov/the-press-office/2015/12/04/fact-sheet-health-educators-climate-commitment
[15] ANHE. https://envirn.org/anhe-white-house-climate-and-health-roundtable
[16] https://obamawhitehouse.archives.gov/realitycheck/the-press-office/2015/04/07/remarks-president-after-roundtable-impacts-climate-change-public-health

to work with academic colleagues and the White House on making a difference on a national scale.

GLOBAL CONSORTIUM IN CLIMATE CHANGE AND HEALTH EDUCATION

As of late fall 2017, more than 125 institutions of higher education have committed to ensuring that the health professionals of tomorrow are fully prepared to address all health risks—including those resulting from the health impacts of climate change. Representing an estimated 90,000 students from 15 countries on six continents, this global coalition has pledged to provide the next generation of health practitioners with the capacity to address the health needs of communities and patients, both now and into the foreseeable future. These learnings must be based on the best available science, and benefit from sharing best scientific and educational practices.

Advocacy, Alliances, and Interdisciplinary Partnerships

1. **Alliance of Nurses for Healthy Environments (ANHE)**[17]
   Founded and managed by nurses in multiple practices: hospital-based, public health, school-based, academics, and advanced practice settings, United States and global, the website offers current information, tools, and opportunities for nurses, in education, practice, research, and policy and advocacy. It includes a continuing education course.
   - **AHNE organized White House roundtable,** May 2016,[18] attended by national nursing organizations, to discuss the importance of addressing climate change and health to protect the public's health.
   - **Campaign for Action**[19] is working in every state to mobilize nurses, health providers, consumers, educators, and businesses to strengthen nursing on multiple fronts. Action goals are based on recommendations from the Institute of Medicine's *Future of Nursing* report.
   - **Climate Change, Health, and Nursing: A Call to Action,**[20] January 2017, is a review of the science and regional differences through case studies, concluding with opportunities for nurses to reduce harm by mitigating and adapting to these changes. **Nurses' voices are highlighted through short video stories** that describe the many ways nurses are leading the profession in addressing climate change. It is also possible for participants to include new stories.
2. **Green Initiatives in Schools (Powers & Kennedy, 2011)**[21]
   Examples of green initiatives provided by schools include providing first-year students with a stainless steel reusable coffee mug, encouraging car-pooling/mass transit, using green cleaning products, buying printers that print double sided by default, turning off computers when not in use, moderating temperatures in offices and classrooms, banning bottled water, encouraging electronic submission of assignments, using paper cups instead of plastic, donating used textbooks to other countries, encouraging telecommuting, using electronic calendars instead of paper ones, and storing student data electronically to save paper.
3. **Consortiums, Collaboratives**
   - **Climate Health Literacy Consortium (CHLC)**[22] CHLC is a collaboration of the leading organizations around the country working to educate the public about the health effects of climate change. This Consortium is committed to a concerted effort within the healthcare sector to educate healthcare professionals about the relationship between climate change and human health, thus leading to a deeper understanding of how climate change policy and consumption choices influence the health of our communities.
   - **Climate for Health** Five Major Nursing Organizations Commit to Climate Action: the Association of Public Health Nurses (APHN), National Association of Hispanic Nurses (NAHN), National Student Nurses Association (NSNA), Nurse Alliance of Services Employees International Union (SEIU) Healthcare, and the Public Health Nursing Section of the American Public Health Association (APHA) (see the Nursing Collaborative on Climate Change and Health to Catalyze Advocacy http://climateforhealth.org/five-major-nursing-organizations-commit-climate-action).
   - **Health Care Without Harm (HCWH)**[23] **US-Canada** NURSE'S TOOL KIT, Research collaboratives, Green healthcare initiatives, CleanMed conference, Community and Hospital Initiatives, Healthy Families and more.
   - **Conveying the Human Implications of Climate Change:**[24] A Climate Change Communication Primer for Public Health Professionals to support (a) educating the public and policy makers about climate change and associated health impacts and (b) being strong advocates in professional settings for mitigation and adaptation practices.
   - **Luminary Project** Collaboration network with the Nurses' Work Group of HCWH. It provides contact information to connect with nurses who develop environmental projects.[25]
   - **Nurses for Cool and Healthy Houses**[26] A collaboration of graduate students of the University of Michigan Public Health, Urban Planning and Natural Resources, the Fresno County Department of Public Health, and Fresno State University nursing students developed a Residential Climate Change Residential Intervention, "Nurses for Cool and Healthy Houses." The program includes a

[17] ANHE. https://envirn.org

[18] WH Conference. https://envirn.org/anhe-white-house-climate-and-health-roundtable

[19] Call to Action blog. https://campaignforaction.org/climate-change-health-nursing

[20] Call To Action. http://envirn.org/climate-change-health-and-nursing

[21] http://greenhealthcare.ca/wp-content/uploads/2016/02/CCGHC-DiscussionPaper-GreenNursing.pdf (p. 6)

[22] CHLC. https://noharm-uscanada.org/issues/us-canada/chlc-tools-and-resources

[23] HCWH. https://noharm-uscanada.org

[24] Conveying the Human Implications of Climate Change: A Climate Change Communication Primer for Public Health Professionals. https://www.climatechangecommunication.org/all/conveying-the-human-implications-of-climate-change/

[25] Luminary Project. https://noharm-uscanada.org/content/us-canada/luminary-project

[26] Collaborators were awarded funding from Health Care Without Harm to implement their ideas and to codirect "Nurses for Cool and Healthy Homes." https://www.phi.org/uploads/application/files/h7fjouo1i38v3tu427p9s9kcmhs3oxsi7tsg1fovh3yesd5hxu.pdf

Home Heat Risk Assessment in the form of a short quickly administered checklist. See Nurses for Cool and Healthy Homes: www.youtube.com/watch?v=8TEAPFlO-00

FUTURE WORK TO BE DONE

> What is missing is training for health workers to integrate this knowledge (climate and health) into daily practice, to enhance individuals' and communities' action to protect their own health while helping save the planet. (Carlos Dora, coordinator, Public Health and the Environment, World Health Organization and a member of the GCCHE Advisory Council.)

Although nursing associations' policies, position statements, and resolutions have long recognized climate change as a health threat, Divakaran et al. (2016) argue that climate change remains underrepresented in formal nursing curricula and practice. The authors observe that "although it is well known that health is influenced by social determinants, climate change is an underrepresented determinant of health within nursing and healthcare literature, curriculum, and practice. There is urgent need to recognize climate change as a current and future threat to human and environmental health" (Divakaran et al., 2016).

1. **Educate—Climate change integration in the curriculum**
   - *Undergraduate:* Integrate climate change and environmental health content into undergraduate nursing curricula with relevant impacts to human health.
     - *Course:* The most commonly cited class is the community health nursing course, but some schools have electives within nursing or science. Although some schools weave this content throughout the curriculum, other schools report integration only within the leadership or professional issues courses or a health and environment curriculum or a health promotion course (Powers & Kennedy, 2011).
   - *Scenario driven:* Make climate change real through clinically relevant scenarios in skill sessions: hands-on scenario-driven activities.
   - *Lecture:* Provide one lecture in the core curriculum explaining the links between health and climate, nested within a broader context of the links between health and the natural environment, with a focus on local health effects, inequity in health effects, and the opportunities for chronic disease prevention (Barna et al., 2012).
   - *Children-specific:* Increase healthcare provider training on human health impacts of climate change and educational programs that are children-specific.
   - *Continuing education (CE) courses:* Develop CE courses and increase distance learning webinar and courses with focus on climate change and health and nurse opportunities in education, mitigation, adaptation, and advocacy.
2. **Research:** Increase research to amplify current information and to model impacts of climate change and infectious diseases and to guide educational programs and governmental policy.
3. **Partnerships:** Increase relevant partnerships in the healthcare, private sector, research, and political sectors.
4. **Vulnerable Populations:**
   - Increase climate change–risk communications in vulnerable populations.
     - Design risk-communication messaging that targets high-risk populations.
     - Assure messages are culturally sensitive and address health risks and vulnerabilities.
   - Engage in Community-Wide Vulnerability Mapping. Nurses can contribute to the development of vulnerabilities and risk mapping by providing assessments and identification of vulnerable populations in their communities. See Denver's Department of Environmental Health, interactive heat mapping tool: climate and health equity vulnerability index at fourtwentyseven.maps.arcgis.com/apps/MapJournal/index.html?appid=64ef015257ad4ab7bc70363a33f24123.

SUMMARY

Research and increasing frequency of extreme weather events and changes in geographical areas of climate-sensitive infectious disease transmitters have served to revise considerably our understanding of climate-change impact on environments and human health. An important consequence of this understanding is the awareness that climate change's negative health effects are most severe for those who are most at risk and that these challenges to population health clearly demonstrate the imperative role of nurses (Goodman, 2016).

The skill set that nurses bring to mitigate against and adapt to climate change's influence on heath is essential. Effective solutions for protecting community health will depend on knowledgeable and competent nurses who can identify existing and anticipated emerging health threats in their regions. More schools are including climate change and health curricula in the coursework, yet this integration must increase to meet the challenges and the pledge by the Health Educators Commitment. Educators must also share their experience in teaching climate change to identify best practices. There are many resources and successful advocacy examples and tool kits for nurses to effectively adapt and mitigate the negative consequences. Furthermore, collaboration between nurses and their professional organizations can raise the volume of the professional collective voice in local, national, and international conversations. Through active roles as educators, research consumers, health messengers, client advocates, leaders, and change agents, nurses are vital partners in developing and implementing national and community strategies for protecting individual and overall community health. Nurses' advocacy extends to promoting public and policymaker awareness and preparedness for the fight against the negative health effects of climate change—bringing their knowledge, skills, and critical thinking to "the greatest global health opportunity of the 21st century."

STUDY QUESTIONS

1. Each region of the United States experiences, differently, real and potential climate change effects. How are the climate drivers in your practice community integrated into policies and practices? How are nurses involved?
2. How are most at risk vulnerable populations in your area of practice identified, who are those most susceptible and or vulnerable? And how are they integrated into the healthcare system, and what are the mitigation or adaptation plans in their nursing assessments?
3. How are nurses in your area of practice addressing climate change and health impacts or involved in other environmental/climate-sensitive practices or policies.
4. Where would climate change and health and the nurses role in practice and policy fit within the nursing curriculum, methodology and educational levels. How have other nursing programs incorporated climate change and health in their curriculum?
5. What are organizational support partners and how are they supporting Green Team development or promoting other environmental health and climate change health effects practices and policies?

USEFUL LINKS

Alliance for Nurses for Healthy Environments (ANHE)

- Climate Change, Health and Nursing: A Call to Action. Nurses' Personal Stories. http://envirn.org/climate-change-health-and-nursing
- Advancing Clean Air, Climate, and Health: Opportunity for Nurses. 3 Modules. https://envirn.org/advancing-clean-air-climate-health-opportunities-for-nurses

ANHE—Climate Action Network (CAN) International. www.climatenetwork.org/profile/member/alliance-nurses-healthy-environments-anhe

Centers for Disease Control and Prevention (CDC). www.cdc.gov/climateandhealth

CDC Climate Change and Health Fact Sheets

- Extreme Rainfall and Drought. www.cdc.gov/climateandhealth/pubs/precip-final_508.pdf
- Warmer Water and Flooding. www.cdc.gov/climateandhealth/pubs/warmer-water-final_508.pdf
- Climate Change Decreases the Quality of the Air We Breathe. www.cdc.gov/climateandhealth/pubs/air-quality-final_508.pdf
- Climate Change Increases Risk of Vectorborne Disease. www.cdc.gov/climateandhealth/pubs/vector-borne-disease-final_508.pdf

Climate Change Evidence and Causes. http://dels.nas.edu/resources/static-assets/exec-office-other/climate-change-full.pdf

Health Care Without Harm. https://noharm-uscanada.org

Nurses Work Group Within Health Care Without Harm. https://noharm-uscanada.org/content/us-canada/nurses-workgroup

National Academies of Science, Engineering and Medicine, Climate Communications Initiative. http://nas-sites.org/americasclimatechoices/cci

National Association of County and City Health Officers (NACCHO). www.naccho.org/programs/environmental-health/hazards/climate-change

National Institutes of Health Disaster Research Response (DR2). https://dr2.nlm.nih.gov

United Nations Framework Convention on Climate Change Paris Climate Accord. http://unfccc.int/paris_agreement/items/9485.php

U.S Global Change Research Program (USGCRP), 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I. https://science2017.globalchange.gov

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